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RESEARCH ARTICLE

Non-Performing Assets and Bank Profitability in South Asia: The Moderating Role of Capital Adequacy

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ABSTRACT

This study investigates the direct link between non-performing assets (NPAs) and bank profitability in South Asia and whether capital adequacy serves as a moderator between the two. The study employs a balanced panel of 10 banks from 5 countries (India, Bangladesh, Pakistan, Sri Lanka, and Nepal) with 100 bank-year observations for the period 2013-2022, and estimates Pooled Ordinary Least Squares (OLS) regressions with heteroskedasticity-robust standard errors. An interaction term (GNPA × CAR) is added to check the interaction between the Capital Adequacy Ratio (CAR) and the NPA-profitability relationship. The Gross NPA (GNPA) ratio is negatively correlated with Return on Assets (ROA) ($\beta = -0.0276$, $p = 0.030$), which is consistent with the fact that poor asset quality leads to lower bank profitability. The interaction term GNPA × CAR is negative ($\beta = -0.0038$) and only slightly significant at the 10% level ($p = 0.079$), but not at the 5% level. This offers only a tentative indication that the sampled banks were not immune to the profitability hit from NPAs even if they had higher capital levels. At the country level, there is significant variation, with the NPA-ROA relationship being strongly negative in India ($r = -0.963$) and Bangladesh ($r = -0.783$) and statistically insignificant in Pakistan and Nepal. Capital adequacy is not enough to protect against shocks from poor asset quality. Thus, in addition to having sufficient capital, there is a need to continue to focus on good credit risk management, proper provisioning and strong asset quality oversight. The results are preliminary and should be interpreted with caution, as the interaction effect is not statistically significant and the sample size is small, and should be replicated with panel-data methods (e.g., fixed effects, system GMM) in future studies.

ARTICLE INFO

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Introduction

The banking sector is the main channel of financial intermediation in emerging economies, and its stability and efficiency in its services are the keystones to sustainable economic development (Syed, 2020). Commercial banks in South Asia, which are typified by high economic growth rates and dynamic financial environments, play a central role in bringing together savings and directing credit to areas of productive activities. The unrelenting issue of non-performing assets (NPAs)—loans and advances which do not yield any

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income to the lending institutions—is, however, a major threat to this vital intermediary role. High NPA rates not only undermine bank profitability and capital adequacy but also limit the lending ability, thereby hampering investment flows and further impeding the expansion of the entire economy (Asian Development Bank, 2021).

The non-performing loans to total gross loans ratio in South Asia is reportedly consistently high in comparison to other emerging market regions, and this is a systemic issue affecting the stability of regional financial systems. This problem was compounded by the 2008 global financial crisis and made more complex by subsequent internal and external economic shocks (Khati & Mukherjee, 2021). The existence of NPAs is a warning sign of underlying weaknesses in credit risk management structures, macroeconomic risks, and, as per agency theory, may be an expression of principal-agent conflict in banking institutions (Jensen & Meckling, 1976).

Although the inverse connection between NPAs and bank profitability has been widely reported in international banking literature (Podpiera & Weill, 2008), the South Asian case demonstrates certain heterogeneities that should be examined more empirically. The role of regulatory capital as a possible moderating variable of this relationship is also of specific importance. According to theoretical frameworks, a bank with a stronger capital buffer is in a better position to absorb losses that arise from non-performing loans and, as a result, protect profitability and financial stability overall (Hellmann et al., 2000). This capital cushioning mechanism is one of the pillars of the Basel Accords, which have been increasingly enforced in South Asian jurisdictions. However, there is still limited and fragmented empirical evidence on whether high Capital Adequacy Ratios (CAR) effectively reduce the negative effect of NPAs on profitability in the South Asian region. The existing literature has been mainly limited to single-country research (e.g., Dahal, 2023, on Nepal; Gaur & Mohapatra, 2021, on India), and there is a significant gap in research with respect to cross-national dynamics and comparative mechanisms involved.

This research fills this critical gap by focusing on both the direct correlation between NPAs and profitability of large commercial banks in five South Asian countries, as well as the moderating role of capital adequacy on the nexus. Through rigorous econometric analysis, the study sought to provide evidence-based information about the complex interactions between asset quality, capital strength, and bank performance within the South Asian banking environment.

The present research makes a number of important contributions to the banking and finance literature. First, it offers a comparative and up-to-date discussion of the NPA-profitability nexus in five major South Asian economies. Second, it explicitly models and tests the moderating impact of CAR through an interaction term, which goes beyond the literature that treats capital as a linear control variable, providing a more detailed view of its impact. The findings will be useful to banking regulators in structuring and setting capital adequacy levels, to bank managers in devising capital and risk management policies, and to investors in understanding the risk-return profile of South Asian banks.

Research Objectives

The research was directed by a number of specific goals aimed at providing a thorough examination of the research problem:

1. To test the direct relationship between Non-Performing Assets (Gross NPA ratio) and the profitability of South Asian commercial banks (ROA) over the period between 2013 and 2022.

2. To check if the relationship between NPAs and bank profitability is moderated (strengthened or weakened) by Capital Adequacy Ratio (CAR).

3. To understand the bank-specific factors (such as operational efficiency, asset composition, funding structure) that are important in determining profitability and NPAs.

4. To draw comparisons in the NPA-profitability relationship among the five South Asian countries selected, in order to establish country-level heterogeneities.

5. To offer policy recommendations to banking regulators and bank management in South Asia for optimal capital buffers and asset quality management based on evidence.

Literature Review

As developed by Jensen and Meckling (1976), agency theory provides one of the strongest insights into the nature of NPAs. It posits the existence of conflicts of interest between principals (i.e., bank shareholders) and agents (i.e., bank managers). Managers, whose compensation may be based on short-term performance goals such as loan volume, could take unnecessary risks by lending to less creditworthy borrowers. Such moral hazard behaviour may result in a growth of loan defaults and

rampant NPAs. Berger and DeYoung (1997) notably framed this within the context of the "bad management" hypothesis, which proposes that such managerial decisions are key contributors to problem loans.

Financial fragility theories describe why banks are predisposed to crises and how capital structure affects risk-taking behaviour. According to Diamond and Rajan (2001), banks create liquidity by financing illiquid long-term assets with liquid short-term deposits—a phenomenon that exposes them to runs. Bank capital in this context serves as a key cushion. Hellmann et al. (2000) argue that moral hazard can be contained by capital requirements, but not entirely. These theories imply that undercapitalized banks are more likely to be tempted to "gamble for resurrection" by assuming excessive credit risk, which manifests in the form of larger NPAs.

The negative correlation between NPAs and bank profitability is well established in a large body of international literature. Podpiera and Weill (2008) found that the "bad management" hypothesis has significant empirical support in the Czech banking sector, implying that cost inefficiency precedes increases in NPAs. These global findings are supported by research conducted on South Asia. Both bank-specific and macroeconomic factors were identified by Anita et al. (2022) and Gazi et al. (2022) in multi-country studies as key drivers of NPAs and profitability in SAARC countries. In the case of India, the NPA problem has been disaggregated in various studies, and Gaur and Mohapatra (2021) provided a direct case study of the relationship between NPA and profitability.2.3 Capital Adequacy as a Moderator

In the literature, it is becoming more and more acknowledged that capital adequacy can be an important moderating factor. It is postulated that a higher CAR cushions unexpected losses caused by NPAs with a thicker buffer, and hence weakens the negative transmission between NPAs and bottom-line profitability. In a study of U.S. banks, Ibrahim et al. (2025) explicitly tested this moderating role and concluded that CAR has a significant moderating effect on the negative impact of NPLs. This moderating effect is now being explored in the South Asian context. Dahal (2023) studied the moderating role of CAR in the commercial banks of Nepal, and Sinha and Basu (2025) refer to CAR as a buffer for Islamic banks in Bangladesh. These studies provide a solid basis for speculating that CAR is a key moderator, but the direction and impact of this effect is an empirical issue.

Research Methodology

Data and Sample

The data set used in this study was a balanced panel data set comprising 10 major commercial banks from five countries: India (State Bank of India, HDFC Bank), Bangladesh (BRAC Bank, Sonali Bank Ltd), Pakistan (National Bank of Pakistan, Allied Bank Ltd), Sri Lanka (Sampath Bank, Bank of Ceylon), and Nepal (Nabil Bank, Nepal Bank Ltd). The sample was chosen to represent systemically important banks in the public and private sectors in each country. It spanned 10 years (2013-2022) and 100 bank years of observations. The selected banks were sampled to gather financial data from their audited annual reports, with the financial data from central bank databases and S&P Capital IQ used to complement and cross-check the data.

The sample was purposively selected to include the two most important banks in each national banking system, not as a convenience sample. The Reserve Bank of India (Reserve Bank of India, 2024) designates both State Bank of India and HDFC Bank as Domestic Systemically Important Banks (D-SIBs) in India, with SBI being the largest bank in the country with approximately 23% of the banking-sector assets and HDFC Bank being the largest private-sector bank in India by assets (Screener, 2024). Sonali Bank is the largest state-owned commercial bank in Bangladesh (Banglapedia, 2021), and BRAC Bank is one of the largest and most successful private commercial banks in the country (Bonikbarta, 2025). The National Bank of Pakistan is the top government-owned commercial bank in Pakistan and is an agent of the State Bank of Pakistan (SBP) (Wikipedia, 2025b), and Allied Bank Limited has the third largest branch network in Pakistan and an estimated 7% of system-wide bank deposits (Gulf News, 2025). Bank of Ceylon is the largest bank in Sri Lanka, representing around 23% of the sector loans and deposits, and Sampath Bank is one of the largest private-sector banks in Sri Lanka, both of which are designated Domestic Systemically Important Banks by the Central Bank of Sri Lanka (The Island, 2025). Nabil Bank is the largest private-sector commercial bank in Nepal by asset size and the first private-sector bank in the country (ICRA Nepal, 2016), while Nepal Bank Limited is the first and oldest bank in Nepal and one of the largest state-owned commercial banks in the country (Nepal Bank Limited, n.d.).

The sample is purposive and market-leadership based, and includes only two banks per country, but represents a significant portion of the systemically important banking activity in each country. However, the

sample size of 10 banks (100 bank-year observations) is a significant limitation in the generalizability of the results to the South Asian banking sector as a whole, and smaller, regional or specialized banks may have different NPA-profitability relationships that are not represented here. This limitation, and its implications for the interpretation of the results, is discussed further in Section 6.2.

Variable Definitions and Measurement

The variables employed in this research are defined and measured in accordance with the established literature in banking and finance. Table 1.1 summarises the dependent, independent, moderating, and control variables.

Table 1.1

Variable Definitions and Measurement

Variable	Abbreviation	Measurement Formula	Expected Sign
Dependent Variable (Profitability)			
Return on Assets	ROA	Net Income / Avg. Total Assets × 100	Dependent
Independent and Moderating Variables			
Gross NPA Ratio	GNPA	Gross NPAs / Gross Advances × 100	Negative (−)
Capital Adequacy Ratio	CAR	(Tier 1 + Tier 2 Cap.) / RWA × 100	Positive (+)
Control Variables (Bank-Specific)			
Net Interest Margin	NIM	(Int. Income − Int. Expense) / Avg. Earning Assets × 100	Positive (+)
Cost-to-Income Ratio	CIR	Operating Expenses / Operating Income × 100	Negative (−)
Loans-to-Assets Ratio	LTA	Total Loans / Total Assets × 100	Ambiguous (+/−)
Equity-to-Assets Ratio	ETA	Total Equity / Total Assets × 100	Positive (+)

Note: Variables are defined following standard banking literature conventions. All ratios are expressed in percentage terms.

Econometric Model

Since the dataset was structured as a pooled cross-section and because this analysis is exploratory, we used Pooled Ordinary Least Squares (OLS) regression. Although this method does not adjust for unobserved heterogeneity across banks (which would require panel data techniques such as fixed effects), it provides useful initial estimates of the relationships of interest. We estimated two models:

Model 1 (Direct Effects):

$$ROA_{it} = \beta_0 + \beta_1 GNPA_{it} + \beta_2 CAR_{it} + \beta_3 NIM_{it} + \beta_4 CIR_{it} + \beta_5 LTA_{it} + \beta_6 ETA_{it} + \varepsilon_{it}$$

Model 2 (Moderation):

$$ROA_{it} = \beta_0 + \beta_1 GNPA_{it} + \beta_2 CAR_{it} + \beta_3 (GNPA \times CAR)_{it} + \beta_4 NIM_{it} + \beta_5 CIR_{it} + \beta_6 LTA_{it} + \beta_7 ETA_{it} + \varepsilon_{it}$$

Where: ROA_{it} = Return on Assets; $GNPA_{it}$ = Gross NPA ratio; CAR_{it} = Capital Adequacy Ratio; $(GNPA \times CAR)_{it}$ = Interaction term; control variables are as defined in Section 3.2.

Diagnostic tests were conducted to assure the validity of the OLS assumptions. A Breusch–Pagan test ($p < 0.05$) confirmed the presence of heteroskedasticity. Particular attention was paid to the interaction term β_3: a

positive coefficient ($p < 0.05$) would imply that CAR mitigates the adverse effect of NPAs (supporting H2), whereas a negative coefficient would imply the opposite.

Limitations

Pooled OLS does not control for unobserved bank-specific effects (e.g., management quality, corporate culture). 2. We are not able to handle the possibility of endogeneity between CAR and NPAs and profitability. 3. The model presupposes that relationships are linear and time-invariant. 4. Future research should be conducted with fixed effects or system GMM to obtain more robust inference.

Statistical Software and Tools

Data were processed statistically using Stata 17.0 (StataCorp LLC, College Station, TX, USA). The use of Stata was driven by its many advantages for panel data econometrics and its widespread use in banking and finance research, which allowed for replication and comparison with existing research.

The following procedures were used. Data management and preparation: The financial data derived from analysing annual reports and central bank databases was structured and cleaned using Microsoft Excel 2021. The data were then imported into Stata using the import excel command. The financial ratios and interaction term (GNPA × CAR) were calculated using the generate and egen commands in Stata. Descriptive statistics: The summarize command with the detail option generated summary statistics. The bysort prefix was used to obtain country-level statistics.

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Correlation analysis: The pwcorr command computed Pearson correlation coefficients. Diagnostic tests for multicollinearity: VIF were estimated using the vif post-estimation command. Regression analysis: Pooled OLS regressions (Models 1 and 2) were estimated using the regress command with the robust option. The Breusch–Pagan test was performed using the estat hettest command.

Supplementary analysis with Python and SPSS: Python 3.9 (with SciPy, pandas, and seaborn) and IBM SPSS Statistics 28.0 were also used to conduct robustness checks, data validation, and additional visualization. Data manipulation and descriptive statistics were performed using pandas (v1.5.3), econometric modelling (OLS regression with robust standard errors) using statsmodels OLS.fit() (cov_type='HC3'), statistical tests using SciPy, and visualization using matplotlib and seaborn. Cross-validation was carried out using SPSS with the Linear Regression procedure and bootstrap standard errors (1,000 replications). The comparison of Python and SPSS results with Stata results ensured consistency and reliability of findings.

Marginal effects calculation: The conditional marginal effects of GNPA on ROA at different levels of CAR (Table 1.5) were computed manually using coefficient estimates from Model 2: $\partial ROA/\partial GNPA = \beta_1 + \beta_3 \times CAR$. Results presentation: The esttab command was used to export regression output. Stata native graphics were used for visualizations (e.g., Figure 1.1).

Results and Analysis

Descriptive Statistics

Table 1.2 provides an overview of the major variables for the entire sample. The overall mean ROA of the 10 banks over the 10 years was 1.26%, and the mean Gross NPA ratio was 6.68% with considerable variation (Std. Dev. = 7.33). The average CAR was 14.51%, which is generally above the minimum requirements prescribed by Basel III, but also highly dispersed.

Table 1.2

Descriptive Statistics (N = 100)

Variable	Mean	Median	Std. Dev.	Min	Max
ROA (%)	1.26	1.2	0.7	−0.19	3.25
ROE (%)	15.02	15.71	7.58	−3.78	42.94

GNPA (%)	6.68	3.94	7.33	0.55	35.28
CAR (%)	14.51	14.32	3.9	−0.59	25.2
NIM (%)	2.92	3.12	1.46	−1.43	5.55
CIR (%)	51.75	50.09	13.11	25.3	94.01
LTA (%)	56.17	59.99	13.93	27.45	76.6
ETA (%)	8.4	8.23	3.15	−0.30	17.72

Correlation Analysis

Table 1.3 presents the Pearson correlation matrix. The correlation of GNPA with ROA (r = −0.596, p < 0.01) is negative, as expected. Interestingly, CAR is positively correlated with ROA but weakly and statistically insignificantly (r = 0.100, p = 0.321), raising initial doubts about the tendency of increased capital to result in increased profitability in this sample. The negative correlation between GNPA and NIM (r = −0.822) is notably strong and indicates that banks with larger NPAs also face difficulties in preserving their interest margins. All VIF values fell below 5, implying no serious multicollinearity issue.

Table 1.3

Pearson Correlation Matrix

Variable	ROA	ROE	GNPA	CAR	NIM	CIR	LTA	ETA
ROA	1							
ROE	0.768***	1						
GNPA	−0.596***	−0.443***	1					
CAR	0.1	0.222**	−0.209**	1				
NIM	0.672***	0.524***	−0.822***	0.247**	1			
CIR	−0.432***	−0.355***	0.553***	−0.552***	−0.643***	1		
LTA	0.391***	0.148	−0.634***	−0.259***	0.576***	−0.366***	1	
ETA	0.510***	0.098	−0.331***	0.351***	0.408***	−0.377***	0.273**	1

Note: *** p < 0.01, ** p < 0.05, * p < 0.1.

Pooled OLS Regression Results

Table 1.4 presents the results of the Pooled OLS regressions with robust standard errors.

Table 1.4

Pooled OLS Regression Results for ROA

Variable	Model 1: Direct Effects	Model 2: Interaction
GNPA	−0.0276**	0.0264
	-0.0125	-0.0328
CAR	−0.0674***	−0.0010
	-0.0201	-0.0288
GNPA × CAR	—	−0.0038*
		-0.0021
NIM	0.2143***	0.2735***
	-0.0635	-0.0711
CIR	−0.0085	−0.0086
	-0.006	-0.0059
LTA	−0.0156***	−0.0166***
	-0.0059	-0.0058
ETA	0.0866***	0.0830***
	-0.0178	-0.0177
Constant	1.5420**	0.894
	-0.612	-0.674
R^2	0.579	0.593
Adj. R^2	0.552	0.562
F-statistic	21.36***	19.22***

Note: Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Model 1: Direct Effects

In Model 1, the coefficient of GNPA is −0.0276 and significant at 5% level (p = 0.030), thus it can be concluded that an increase in NPAs reduces the profitability of banks (H1 is accepted). In other words, for every 1 percentage point rise in GNPA, there is a 2.76 basis point drop in ROA, ceteris paribus.

The CAR coefficient is negative (−0.0674) and statistically significant (p = 0.001), which contradicts the theory that higher capital results in higher profitability. This counterintuitive result could be explained by several factors: (i) banks with asset quality problems might need to hold higher capital buffers as required by regulators; (ii) higher capital reduces leverage; and (iii) higher capital may impose operational constraints on banks in some markets.

The control variables include NIM which shows the expected positive effect (0.2143, p = 0.001) indicating that net interest income generation is a strong determinant of profitability. The CIR coefficient is negative, but not statistically significant (p = 0.158). There is a strong negative association (−0.0156, p = 0.009) between LTA and profitability. The positive effect of ETA (0.0866, p < 0.001) is strong, indicating that equity cushions enhance profitability.

Model 2: Testing the Moderation Hypothesis

To test H2, the interaction term between GNPA and CAR is added to Model 2. The results show an unexpected and conceptually challenging result: the interaction term (GNPA × CAR) is negative (β = −0.0038) and marginally significant at the 10% level (p = 0.079), but not at the 5% level. This marginal significance makes the finding a tentative evidence and not a conclusive result.

The negative sign indicates that the negative impact of NPAs on profitability was not reduced, and perhaps even increased, for banks with higher capital adequacy ratios. This is contrary to the buffering hypothesis (H2 not supported at the 5% level). It should also be noted that the direct effect of GNPA is statistically insignificant and changes sign (0.0264) when the interaction term is included in Model 2, which is a statistical artifact of the model specification of the interaction term and does not mean that NPAs have a positive effect on profitability.

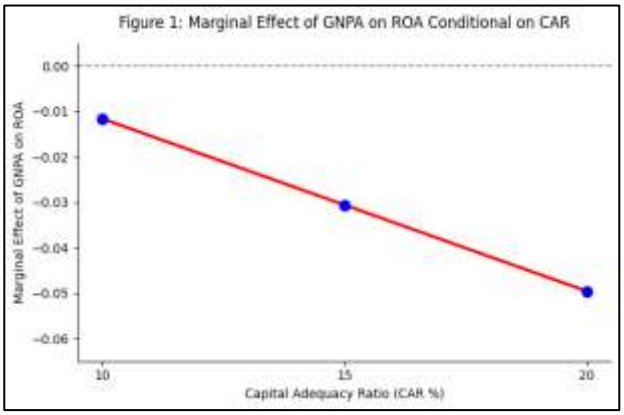
The marginal effect of GNPA on ROA conditional on CAR is calculated as: ∂ROA/∂GNPA = 0.0264 + (−0.0038) × CAR. The marginal effect is −0.0306, which indicates that a one-percentage-point rise in GNPA corresponds to a 3.06 basis-point decline in ROA for a bank with a CAR of 15%. This is shown in Table 1.5 and Figure 1.1.

Table 1.5

Marginal Effect of GNPA on ROA at Different CAR Levels

Capital Adequacy Ratio (CAR)	Marginal Effect (∂ROA/∂GNPA)
10%	−0.0116
15%	−0.0306
20%	−0.0496

Figure 1.1



Marginal Effect of GNPA on ROA Conditional on CAR

Several interpretations are possible for this counterintuitive finding:

1.Endogeneity: The poor asset quality of banks could require the process of raising capital, creating a mechanical negative relationship between CAR and profitability that our pooled OLS model cannot separate. **2. Leverage effect:** When CAR increases, ROA decreases due to the reduction in leverage. The regulatory CAR measure might not capture actual loss-absorbing capacity. **3. Regulatory vs. economic capital:** The regulatory CAR measure may not accurately reflect the loss-absorbing capacity. **4. South Asian context:** In emerging markets with less robust institutions, higher capital requirements may create operational constraints or misalign incentives, not protect.

The inclusion of the interaction term enhances the model fit (R^2 rises from 0.579 to 0.593), suggesting that this relationship should be explored further with more sophisticated panel data methods.

Heterogeneity Analysis: Country-Level Correlations

To investigate country-specific differences in the GNPA-profitability relationship, we computed correlation coefficients for each country individually. The results are presented in Table 1.6.

Table 1.6

Country-Level Descriptive Statistics and Correlations (2013–2022)

Country	Mean ROA	Mean GNPA	Mean CAR	GNPA-ROA Correlation
India	1.16%	3.61%	14.87%	−0.963***
Bangladesh	0.85%	14.22%	11.79%	−0.783***
Sri Lanka	1.32%	3.59%	14.65%	−0.626***
Pakistan	1.09%	9.71%	19.46%	−0.319
Nepal	1.91%	2.30%	11.80%	−0.362

Note: *** $p < 0.01$. Correlations for Pakistan and Nepal are not statistically significant.

The diversity is very pronounced. The negative correlation between GNPA and ROA is almost perfect in India ($r = -0.963$, $p < 0.001$) which shows the severity of the NPA crisis. The negative correlation is also very strong in Bangladesh ($r = -0.783$, $p < 0.001$). The correlation between Sri Lanka and the other countries is moderately negative ($r = -0.626$, $p = 0.003$). In contrast, the correlations for Pakistan and Nepal are not significant and weak, indicating that other factors may be more important in these markets.

Important limitation: The interaction effect (GNPA × CAR) cannot be estimated at the country level with sufficient confidence using regression, because of the small sample sizes per country ($n = 20$). The above correlations are descriptive evidence of heterogeneity and should be interpreted with caution.

Discussion

The empirical evidence is strong and conclusive in support of Hypothesis 1: NPAs have a significant negative impact on bank profitability in South Asia. The large negative coefficient of GNPA in the pooled regression, along with the high negative correlation ($r = -0.596$), validates the negative effect of deterioration in asset quality on ROA. Most importantly, this relationship is very strong in India ($r = -0.963$) and Bangladesh ($r = -0.783$) as revealed by the country level analysis. The results are in line with agency theory and the "bad management" hypothesis (Berger & DeYoung, 1997).

The results for Hypothesis 2 (moderating effect of CAR), however, provide only weak and inconclusive support. The interaction is negative ($\beta = -0.0038$), but only significant at the 10% level ($p = 0.079$) and not the conventional 5% level, indicating a negative interaction (which would be buffering). With some caution, this indicates that the negative impact of NPAs on profitability was not reduced in our sample and could have been slightly greater for better-capitalized banks. This result is contrary to the regulatory expectations, but it is only marginally statistically significant and the limitations of the Pooled OLS design should be taken into account when interpreting the result.

Several explanations may account for this paradoxical outcome: **1. Endogeneity and regulatory response**—When banks have to raise their NPAs, regulators often force them to raise their capital buffers. **2. Mechanical leverage effect**—increased CAR reduces ROA. **3. Quality vs. quantity of capital**—regulatory ratios may not be meaningful in emerging markets. **4. Signaling problems**—high CAR may signal underlying stress. **5. Opportunity costs**—High capital levels can create constraints that exceed risk-absorbing benefits, particularly in very high capital levels.

The interaction term is significant at the 10% level ($p = 0.079$) but not at the 5% level. This finding should be interpreted with caution. Panel-data techniques (e.g., fixed effects, system GMM) are needed to test this relationship more conclusively in future research.

Revised Hypothesis Assessment:

- H1 (NPAs negatively affect profitability): Strongly supported.
- H2 (CAR buffers this relationship): Not supported at the 5% level; The interaction is negative, but the evidence is only marginally significant (10% level) and should be considered tentative.

Practical Implications

For Banking Regulators

Asset quality first: The strong negative relationships between NPAs and profitability, particularly in India ($r = -0.963$) and Bangladesh ($r = -0.783$), highlight the importance of asset quality management as a key component of prudential supervision. No amount of

capital can replace good credit underwriting and monitoring.

Capital adequacy alone is insufficient: Our preliminary conclusion that the negative impact of NPAs is not clearly offset by CAR serves as a warning against using capital ratios as the only measure of bank resilience. In addition to capital requirements, regulators could consider enhancing asset quality, provisioning, and NPA-management systems in their supervisory evaluations.

Context matters: The significant differences between countries suggest that country-specific calibration of Basel standards might be necessary.

For Bank Management

1. Priorities credit risk management: Banks need to invest significantly in good credit appraisal, continuous monitoring of loans and effective recovery systems. **2. Optimise capital structure:** Banks need to strike a balance between capital levels and profitability objectives, ensuring that they do not have too much capital that could negatively impact their performance. 3. **Complementary strategies:** Capital is not enough, banks should work on operational efficiency (CIR) and Net Interest Margin (NIM).

Conclusion

This study investigated the impact of NPA on bank profitability in South Asia and whether the relationship between NPA and bank profitability is moderated by capital adequacy. The study employed Pooled OLS regression on a sample of 10 commercial banks in five countries from 2013 to 2022 and found that the higher the Gross NPA ratio, the lower the profitability of the banks. This negative correlation is especially high in India ($r = -0.963$) and Bangladesh ($r = -0.783$).

The study, however, did not reveal any clear evidence that the increase in the CAR protected banks from NPA shocks, which is contrary to the conventional regulatory theory. The interaction between the GNPA and CAR was negative and only slightly significant at the 10% level ($p = 0.079$), which is less than the usual 5% level. This is a tentative indication that well-capitalized banks were not spared of, and perhaps even suffered a slightly greater, loss of profitability due to increased NPAs. This seemingly paradoxical, but statistically insignificant, finding could be due to endogeneity, a mechanical leverage effect, or the fact that regulatory capital is not measured in the same way in emerging markets. This is a preliminary finding that supports, but does not contradict, the notion that capital alone is enough to protect bank profitability from credit risk shocks, given its marginal importance.

Limitations

There are several important limitations to this study. First, the research design uses Pooled OLS, which is unable to adjust for unobserved bank-specific heterogeneity or to address endogeneity between capital and profitability. Second, the sample is restricted to 10 large commercial banks ($N = 100$ bank-years), which may not be representative of the banking industry as a whole, as smaller, regional, or specialized banks may have different NPA-profitability dynamics that are not reflected here. Third, macroeconomic variables (GDP growth, inflation) that impact NPAs and profitability are not included in the models. Fourth, the observed relationships are associative only; we cannot determine clear causality, especially regarding the CAR interaction effect.

Future Research Directions

Advanced panel methods (fixed effects, system GMM) should be used in future research to deal with endogeneity and unobserved heterogeneity. Non-linearities should also be explored by testing for threshold effects in the CAR-profitability relationship and for non-linear effects of NPAs. Further work may be done to distinguish between Tier 1 (core) and Tier 2 capital. Lastly, a larger sample of banks and the inclusion of macroeconomic control variables would increase the generalizability of the results.

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